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may be a general constitutional and permanent one, or it may be temporary (often more or less periodic) due to abnormal internal secretions or other causes. Here belong, among others, the hyperkinetic, the hysterical and epileptoid offenders.

It would seem as though future progress in an understanding of conduct would lie less in a classification of people into the feeble-minded and normal than in a study of the individual's early training, mentality, social instincts and inhibitions.

2. The great body of the work (pp. 47 to 434) consists of the descriptions of 327 cases of feeble-minded individuals, with the family history as far as could be obtained. These are grouped under the heads: hereditary, probably hereditary, neuropathic ancestry, accident, no assignable cause, and unclassified. These pages contain many interesting and significant details.

3. In the third section dealing with "causes," the author properly criticizes much of the *post hoc ergo propter hoc* argumentation which is extremely widespread among medical writers. Goddard's conclusion that about 80 per cent. of the cases of feeble-mindedness with which he deals are hereditary, probably hereditary or neuropathic is interesting; yet from the nature of the case so precise a figure based on materials that in their nature are unprecise must be regarded as a rough judgment and one of which too much may readily be made. In this section is discussed the heredity of "feeble-mindedness" and the conclusion is reached that normal mentality is dominant over feeble-mindedness. Goddard confesses to having been prejudiced against the view "that the intelligence even acts like a unit character. But there seems to be no way to escape the conclusion." Now, since feeble-mindedness is a social and not a biological term, it would seem almost absurd to seek to find a law of its inheritance. The case seems to be this, a large proportion of the feeble-minded are such because of general failure of development of the intellectual centers. A "general intelligence" there well may be, as he concludes; but that does not pre-

vent the hypothesis of special talents (or their lack) and special elements of self-control. Thus, there may well be an hereditary basis for many of the mental differences between persons, whether "normal" or "feeble-minded."

4. The practical applications from Goddard's study he finds in applied eugenical procedures, especially the prevention of propagation of the defective stock. While our efforts to segregate must be increased, sterilization is useful in cases that can not be otherwise reached, and many mental defectives may well be cared for at their homes.

In general, the book shows some haste in composition and the latter is in spots defective, but nevertheless, it will be everywhere regarded as a useful piece of work and one that every one who is concerned with the troubles of human society will prize.

C. B. DAVENPORT

COLD SPRING HARBOR, N. Y.,

October 31, 1915

Handwörterbuch der Naturwissenschaften.

Herausgegeben von PROF. DR. E. KORSCHULT, Marburg (Zoologie), PROF. DR. G. LINCK, Jena (Mineralogie und Geologie), PROF. DR. F. OLTMANN, Freiburg (Botanik), PROF. DR. K. SCHAUM, Giessen (Chemie), PROF. DR. H. TH. SIMON, Göttingen (Physik), PROF. DR. M. VERWORN, Bonn (Physiologie), DR. E. TEICHMANN, Frankfurt a. M. (Hauptredaktion). Jena, 10 volumes, in 4°, 1912-15. Verlag von Gustav Fischer.

The splendid work issued under the above title and with the editorship indicated is worthy of close inspection from those interested in the various lines of natural science included. The initial *lieferungen* have already been reviewed by Professor Arthur Gordon Webster¹ in these pages and I do not doubt that now on the completion of the work he will favor us with a discussion from the side of the physical sciences. The desirability of having the attention of workers in the natural sciences directed to the "Handwörterbuch" has led to the writing of this review.

¹ SCIENCE, N. S., Vol. XXXVIII., No. 972, pp. 230-233, August 15, 1913.

Professor Webster has already discussed the position of the work among the encyclopedias of the world and has mentioned the excellence of the short biographical sketches, as well as touching on various phases of the biological articles. As suggested by Professor Webster in regard to mathematics, anatomists will be keenly disappointed to find *their* science also neglected, save in the introduction of anatomical work into other branches of natural science; but the "Handwörterbuch" will be found extremely useful in certain lines, none the less. One interesting feature, mentioned by Professor Webster, is the up-to-dateness of the various articles, illustrations from the younger or more recent writers being chosen in preference to time-honored cuts. Perhaps this is partially due to the authors of the individual articles, but it is also evidently the policy of the editors to have the work as complete as possible. The articles are, in general, brief, some of them well illustrated, with the chief sources of literature given at the end.

It has been the privilege of the writer to use this work extensively in a compilation of a biographical nature, and it is a pleasure to say that he has found the "Handwörterbuch" extremely useful. The biographical sketches, of which there are a great many, are short, without illustrations, and give at the close the important sources of information concerning the individual discussed. This feature is very important in a historical study of biology and is a great improvement over the Encyclopedia Britannica, for instance, where sources of reference are mentioned only incidentally. Many names are not included which might justly belong in the work. Mendel is inserted as an afterthought at the close of volume ten. None of the more important human anatomists are included, even those who were engaged in zoological work.

The special articles have been assigned by the editors to prominent scholars in the various lines of work. The recent Amphibia, for instance, are treated in a very complete way by Dr. J. Versluys, in an article covering twenty-five pages. The illustrations might have been better chosen, but they represent the

general features of amphibian morphology. The "Paleontology of the Amphibia" is treated by J. F. Pompeckj, a writer well known to students of paleontology. The article, covering nine pages, is well illustrated, the figures being chosen from among the papers of Williston, Dollo, von Meyer, Moodie and Zittel. The same subject is covered much more fully in volume nine, under the heading "Stegocephalen." Friedrich von Huene is the author of this article, which covers seven pages, richly illustrated, with a good list of recent literature at the end. It is rather unfortunate to separate the discussion of Amphibia and Stegocephalia, since the present writer is firmly convinced that they are both members of the same groups; that is, all of them are Amphibia. Other remarks and illustrations regarding the extinct Amphibia are to be found under the various geological periods. Under "Karbonformation" the only figured representative of the rich vertebrate land fauna of the Coal Measures is the much-worn and time-honored figure of *Lepterpeton Dobbsii*, described by Huxley from the Coal Measures of Ireland, but the discussion, by W. Kegel, is well balanced.

Paleontologists will find the work extremely useful, and especially teachers of paleontology will have a work to which their students can refer for a discussion of general topics, which, in general, have been brought well down to date. Some of the articles are especially refreshing in the presentation of new ideas. Gustav Tornier's article on the paleontology of the reptiles, covering forty pages, is an instance of this. The article is very well illustrated; the figures being chosen from papers by Broili, Broom, Newton, Osborn, Fraas, Tornier and Eaton. Tornier's original reconstructions of *Diplodocus* and *Stegosaurus*, have already attracted the attention of paleontologists and have been discussed especially by Matthew. It is rather startling to see our old friend *Triceratops* sprawling on the ground like a horned toad, but such new ideas are worth while in keeping our interests alert. It is most unfortunate that, in a work of this nature, the important researches of Case and

Williston on the Permian reptiles of America should have been entirely ignored. Some of the many, and much worn, illustrations of the Dinosauria might easily have been replaced by excellent illustrations from one or the other of these writers.

The paleontology of fishes is very fully covered by Pompeckj, illustrations and discussions of typical forms of the various groups being chosen. The reconstruction of the Devonian *Paleospondylus* by Sollas, based on serial sections, is given. The restorations and drawings by Patten and Traquair of the early Devonian Placodermi are well shown in many illustrations, as well as such recent figures as Hay's *Edestus crenulatus*, which is one of several early elasmobranchs figured. Many well-known restorations and figures of fish anatomy from the writings of Dean, Dollo and Woodward complete the work.

The general discussion of the recent mammals by W. Kükenthal is followed by a sixty-four page article by O. Abel on the paleontology of the mammals. This latter section is illustrated by 122 figures, which are well chosen, as we would expect from such an eminent student as Abel.

The article on "Zelle und Zellteilung" covering one hundred and seventy pages, richly illustrated with 225 figures, is one of the more extensive biological articles. It is divided into three sections: (1) Zelle und Zellteilung, Botanisch; (2) Zoologisch; and (3) Zellphysiologie. The botanical section is written by E. Kuster, the zoological section by L. Bruel and the physiology by M. Verworn, each section being followed by numerous references to the important literature.

The anatomy and physiology of the sensory organs, covering sixty-five pages, with eighty-one figures and many bibliographic references, deals with special sense organs throughout the whole range of animal life. The discussion and illustration of this immense subject is necessarily brief and specialists will be disappointed to see their favorite subjects but slightly touched or neglected; however, for a work of this character the article will prove helpful.

The work, taken as a whole, contains many interesting contributions to paleontology and zoology. The articles discussed above may be taken as typical of the other articles in the work. A general index of three hundred and sixty pages closes the work. The individual articles show that a high ideal was adopted, which has been well sustained throughout. The volumes are well printed, the illustrations are clear, and in every way the work lives up to the good reputation so long enjoyed by the press of Gustav Fischer.

ROY L. MOODIE

DEPARTMENT OF ANATOMY,
UNIVERSITY OF ILLINOIS, CHICAGO,
October 30, 1915

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

THE eleventh number of volume 1 of the *Proceedings of the National Academy of Sciences* contains the following articles:

1. *Experiments on the Development of the Limbs in Amphibia*: ROSS G. HARRISON, Osborn Zoological Laboratory, Yale University.

At the time of appearance of the tail bud the anterior limb of *Amblystoma* is already determined in the mesoderm cells of that region of the body wall which lies close to the pronephros and ventral to the third, fourth and fifth myotomes. The prospective significance of this group of cells, as a whole, thus is defined some time before differentiation becomes visible.

2. *A Mechanism of Protection against Bacterial Infection*: CARROLL G. BULL, Rockefeller Institute for Medical Research, New York.

Bacteria circulating in the blood are quickly removed when they are agglutinated or clumped, and the clumps deposited within the organs are taken up by phagocytes and digested. They appear not to be destroyed by solution or lysis through the operation of serum constituents of the blood.

3. *On the Life-History of Giardia*: CHARLES ATWOOD KOFOID and ELIZABETH B. CHRISTIANSEN, Zoological Laboratory, University of California.